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A Study of the Infant Mortality of Madison

by

Katherine Agnes Donovan

A Thesis Submitted for the Degree of

Master of Science

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1911

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TABLE OF CONTENTS.

CHAPTER I. Factors which influence Infant Mortality.
CHAPTER II. Infant Mortality in Madison, 1890-1910.
CHAPTER III. Methods of Preventing Infant Mortality.

CHAPTER I.

Factors which influence Infant Mortality.

CHAPTER I.

All through the world, at the present time, great attention is being paid to the subject of Infant Mortality. The term "Infant Mortality," when used in the correct sense, denotes the number of deaths of infants under one year of age per one thousand births.(1) In the United States there are born each year about 1,400,000 babies. Of this number 280,000, or 20 per cent, die before they are one year of age.(2) This fact is of great importance, not only because of the large number of deaths of babies, but because a great number of these deaths is preventable. France, England and other countries have done a great deal towards the reduction of infant mortality, but the United States has scarcely begun its work in this direction. The American Association for the study and Prevention of Infant Mortality has been formed only recently. It is very important for this purpose that reliable statistics of infant mortality should be available for the whole registration area, and as soon as possible for the whole United States.(3)

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(1) Mortality Statistics: 1909. Bulletin 108.
(2) Ibid.
(3) Ibid.

At the present time, states, representing only about one-half the population of the whole country have laws requiring the registration of the death of all persons giving age, and cause of death.

Dr. Arthur Newsholme, Medical Officer of the Local Government of England, in his recent report on "Infant and Child Mortality," says that the subject of child mortality is of national importance; that it is the most sensitive index we possess of social welfare and of sanitary administration, especially under urban conditions. A high infant mortality implies a high prevalence of the conditions which determine national inferiority.(1)

Realizing that the number of infant deaths would be lowered immensely by campaigns for prevention, the American Association for the Study and Prevention of Infant Mortality was formed. Its objects are to direct attention to the excessive mortality in the United States; to study the causes of this; to suggest means by which it can be reduced.

There are many factors, both before and after birth, which determine whether the infant will live during the first year, and it is only by a study of these

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(1) Thirty-ninth Annual Report of the Local Gov't Board.

factors, and by prevention of adverse conditions that the death rate of infants can be lowered.

The effect of alcohol on Infant Mortality is very marked. Continued inebriety in either parent lessens a child's chances for life and health. Professor Laitenen found that the percentage of living children decreases in proportion to the amount of parental drinking and that the number of dead children and miscarriages increases.(1) The reproduction cells of the father may be injured by excesive alcohol, and so lead to mental and physical deterioration in the offspring, which may be continued and accentuated in succeeding generations.(2)

Repeated maternal intoxication also has a great effect on the offspring. An investigation into this matter showed that of 600 children born of 120 female inebriates, but 42% lived over 2 years, and 55.8% died under 2 years of age or were still born.(3) A comparison between 125 children born of 21 drunken mothers, and 138 born of 28 sober but closely related mothers of the same class, shows the death rate of the latter class to be about one-half as great as the former.(4)

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(1) American Academy of Medicine Conference, 1909, p.11.
(2) Ibid.
(3) Ibid.
(4) Ibid.

The bad effect of alcohol and the decreased vitality of the successive children, when the mother's drinking continues, is shown by the fact that the death rate increases with each child. It is 33.7% among the first born, and 72% for the sixth to the tenth child born in the family.(1)

The ability of the mother to nurse is greatly impaired by drunkenness. Inebriety in the father markedly diminishes the ability of his daughter to nurse. Besides, the environment of a drunkard's home is very unfavorable, and scant care is given the infant.(2)

Because of the abuse of alcohol by many parents, thousands of children are still born, and as many more poisoned before birth.

Dr. Alice Hamilton of Chicago has made investigations to determine the truth or falsity of the theory that there was some relation between the birth rate of different nationalities and the child mortality rate, and that those nationalities which had the largest average number of children per family has the largest proportionate infant death rate.(3) From her investigations she found that the figures bore out the theory that excess-

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(1) American Academy of Medicine Conference, 1909, p.12.
(2) " " " " " " p.13.
(3) " " " " " " p.74.

ive child bearing means excessive child mortality, for in each nationality, the death rate in the large family group was very much higher than in the group of small families. Of 267 families which numbered six children or more, there were 5921 living and 2158 dead. Of 118 families of four children and less, 1458 were living and 197 dead.(1)

She also found out that this mortality increased as the size of the family increased. The effect of excessive child bearing seems more marked in the death of children after birth than in the interruption of pregnancy.(2)

The Jews had the lowest death rate and the Italians the highest. Next to the Jews came the families of mixed nationalities -- American born and Northern Europeans exclusive of Irish, Germans and Scandinavians. The Germans were next to these, then came the Irish, Slavs and Italians.(3)

A summing up of the results of the inquiry into 1600 families of poorer class shows that child mortality increases proportionately as the number of children per family increases, until there is a death rate in families

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(1) American Academy of Medicine Conference, 1909, p.76.
(2) " " " " " " p.77
(3) Ibid.

of eight children and over, which is two and a half times as great as in families of four children and under. The loss of life by abortions is also much greater in large families than in small ones.(1)

Infant Mortality as seen in obstetric practice comprises still births and infant deaths, and is represented by (1) Death due to prematurity. (2) Intranterine death before onset of labor. (3) Death during labor. (4) Death during the first days or weeks of the child's life.(2)

Probably one birth out of six the world over is premature. In the United States conditions are bad. Premature birth is a frequent cause of infant mortality.(3)

Common causes of still births in the mature fetus are prolonged labor, malpresentation, prolapse, or entanglement of the cord, and pelvic deformity of the mother. In any attempt to reduce infant mortality there must be a study of the causes of early abortion in order to prevent it, and a fight made against criminal practices. There must also be careful supervision of the woman before birth. These things must be done by extension of hospital service among the poor in the great

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(1) American Academy of Medicine Conference, 1909, p.79.
(2) " " " " " " p.15.
(3) " " " " " " p.16.

cities, and by the regulation and training of midwives. Midwives are attending 42% of all women in New York city, 40% in Baltimore, 47% of all cases in Chicago, and 86% of all the Italians in Chicago. By these methods infant mortality in obstetric practice can be greatly reduced.(1)

Very closely connected to the high death rates for infants is the increasing number of women working before marriage. Six million women work for pay at 295 different occupations. A certain portion of these occupations demand the attention in considering infant mortality -- (1) Those which affect women in such a way that their child bearing capacities and instincts are impaired. (2) After marriage those taken up that threaten the life of the child directly. Trades which injure women are -- (1) Places where they lift heavy burdens. (2) Physical strain trades -- spinners, shop girls, laundresses; the standing trades -- sweated industries. (3) Nervous strain trades. (4) Factory workers. As an example of the bad effect of factory work on infant mortality we may quote the fact that more white babies per 1000 of population are dying in Fall River, Massachusetts than in any other town in United States but

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(1) American Academy of Medicine Conference, 1909, pp. 21-22.

one -- Biddeford, Maine, another cotton mill town.(1)

Under the causes of infant deaths, tuberculosis is held responsible for 2% and syphilis for 1.2% of the deaths. In reality the deaths of infants from these two causes are far more in number than appears, as many deaths due to these are listed under other headings.

Syphilis is one of the principal causes of the death of the child before birth.(2) Of women infected with this disease 50% are rendered sterile, while a still larger proportion are made sterile after the birth of the first child. Practically all the blindness which babies incur at birth is due to **gonococcus bacillus.** Syphilis either kills the offspring outright, or so vitiates the processes of nutrition that infants come into the world marked for death, or if they survive, carry through life the evidences of degeneracy and decay.(3) The public must be enlightened as to the terrible results of these diseases, and cooperative forces must be set to work in order to reduce infant mortality from this source. Education in sex hygiene in the schools, preceded by courses in biology and physiology in the grades would go a long way towards solving this problem.

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(1) American Academy of Medicine Conference,1909, p.36
(2) Survey, volume 23, p.320.
(3) Monthly Health Bulletin of New York, March 1910.

There is an unusual proportion of infant deaths due to digestive disturbances. This shows the influence of diet on infant mortality, as digestive diseases depend, almost always, on faults in feeding.(1)

Ten bottle fed babies die to one breast fed baby.(2) The breast fed infant, carelessly looked after, has a far better chance to live than the bottle fed infant, more carefully tended.(3)

There is but one truly proper feeding -- suitable breast milk given in a suitable manner.(4)

Undoubtedly a great many deaths could be prevented by a greater persistence on the part of the mother in nursing, or by a greater willingness to employ a wet nurse.(5)

The high mortality of gastro-intestinal disease prevails especially in bottle fed infants. Also the influence of excessively hot weather is seen almost entirely in bottle fed infants. The diet is a factor in the production of death, first through its composition. Faulty cow's milk mixtures have too much to do with it. The

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(1) American Academy of Medicine Conference,1909, p.44.
(2) Health Bulletin of Kansas, June 1910.
(3) Health Report of Indiana, 1905, pp.131-38.
(4) American Academy of Medicine Conference,1909, p.45.
(5) American Academy of Medicine Conference,1909, p.45.

pernicious custom is widespread of giving every infant a formula of a certain strength because it has reached a certain age.(1)

Too little study is given to the effects of the different ingredients of the milk mixture. More infants are overfed than underfed, and this produces digestive distrubances which are often fatal.(2)

The numerous proprietary foods on the market, although they have saved life, are one of the most fertile sources of infant mortality. Not only is the composition of most of them faulty, but they are advised and given on the faulty principle of one food to suit many infants.(3)

Even more important than the composition of the food is its decomposition. Bacterial growth is a great death producer in infant life. There is probably no better culture medium for germs than milk, no medium from which it is more difficult to remove germs entirely. It is not so much the souring of the milk which is harmful, through the growth of germs producing lactic acid, as it is the effect of **micro organisms** of other sorts. Also it is not the germs themselves which kill the infant, but their action on the milk and the poisonous sub-

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(1) American Academy of Medicine Conference,1909,p.47.
(2) Ibid.
(3) American Academy of Medicine Conference,1909,p.48.

stances, the toxins, produced by them. Sterilization and pasteurization which kill the germs and stop further production of toxins, do not destroy those already produced to any great extent. These methods cannot make bad milk good, they merely prevent it from getting worse.(1)

Human breast milk is not strictly sterile, though it usually contains only organisms of low virulence, as staphylococcus albus. Cow's milk is not only not sterile when it leaves the animal containing often, streptococci and tubercle bacilli, but is given many opportunities for further contamination before it reaches the artificially fed infant. G.W.Goler found by careful work in regard to infant mortality in Rochester, New York, that "the infantile death rate bore a close relation to the average number of bacteria per cubic centimeter found in the municipal milk supply." This shows clearly the importance of the bacteriological study of milk, and the need of precautions to minimize the effects of any pathogenic bacteria it may contain.(2)

Provided the mother's breasts are not diseased, human milk is a safe food relatively, as far as the bacterial content is concerned, while the use of cow's milk

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(1) American Academy of Medicine Conference,1909,pp.48-49
(2) American Academy of Medicine Conference,1909,pp.68-70

gives more or less time for the multiplication of bacteria before it is consumed.(1)

Experiments have been made lately which show that there is in raw milk a bactericidal or inhibitory power, which is, however, of short duration. This is important in regard to the artificial feeding of infants, as most infants take their cow's milk from 8 to 12 hours after it has left the animal, and its inhibitory influence on bacteria has largely disappeared.(2)

There is something to be considered in the composition of milk besides proteid, fat, carbohydrate and water. The additional factors include the passage, through the normal milk to the child, of substances which carry on bodily functions including that of protection against infection. It has been proven by Ehrlich and Brieger from experiments on mice, that milk is capable of conveying antitoxic substances, after these have been injected into the mother. It has also been found that the bactericidal power of the serum of the blood in breast fed children was far greater than in those artificially fed.(3)

Of the various ways of feeding, direct maternal

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(1) American Academy of Medicine Conference,1909,p.76.
(2) American Academy of Medicine Conference, 1909, pp.70-72.
(3) American Academy of Medicine Conference,1909, p.68.

nursing gives the greatest protection to the infant, and it follows that everything should be done to stop artificial feeding and so reduce infant mortality.

Although many realize that the breast fed baby is comparatively immune from death, the fact remains that many thousands of infants are unable to obtain maternal nourishment. Two main reasons for this maternal impotency are physical disability, due to improper nourishment and disease, and industrial employment, due principally to abject poverty.(1) Ways and means to remedy these conditions will be discussed in a subsequent chapter.

The enormous death rate among infants during the first months are due almost entirely to congenital debility, malformation, atrophy and other results of immorality, unwholesome social conditions and physical degenerates. One third of the remaining deaths are caused by bad milk, improper feeding, etc., and the other two thirds by casualties and those ordinary ills of infancy, which may almost wholly be prevented by the exercise of reasonable intelligence and care.(2)

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(1) Survey, volume 22, p. 624.
(2) Survey, volume 22, p.623.

CHAPTER II.

Infant Mortality in Madison, 1890-1910.

Chart 1.

	1890	1891	1892	1893	1894	1895
Number of births	242	218	218	217	289	275
Number of deaths exclusive of still births.	74	42	60	38	40	49
Number of deaths of infants under 1 year.	7	7	12	4	7	11
Percentage of infant deaths to total deaths.	9.5	16.7	20	10.5	17.5	20.4
Percentage of infant deaths to infant births.	2.9	3.2	5.5	1.8	2.4	4.0
Number of still births.			2		1	

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Chart 1 -cont.

	1896	1897	1898	1899	1900
Number of births	268	207	72	84	78
Number of deaths exclusive of still births.	36	94	190	206	195
Number of deaths of infants under 1 year.	4	16	30	34	28
Percentage of infant deaths to total deaths.	11.1	17	15.8	16.5	14.4
Percentage of infant deaths to infant births.	1.5	7.7	41.7	40.5	35.9
Number of still births.		2	4		6

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The number of births in Madison for the period 1890 through 1900 was 2168.

The number of deaths for that time was 1024, exclusive of still births.

The number of deaths of infants under one year of age for the same period was 160.

15% of the deaths from 1890 through 1900 were infants under 1 year of age, and 7% of the infants born then, died -- 1 infant out of 14 died before it was 1 year of age.

Chart 2.

	1901	1902	1903	1904	1905
Number of births.	97	208	219	217	367
Number of deaths exclusive of still births.	169	231	238	290	197
Number of deaths of infants under one year.	29	47	41	51	47
Percentage of infant to total deaths.	17.2	20.4	17.2	17.6	23.8
Percentage of infant deaths to infant births.	29.9	22.6	18.8	23.5	12.6
Number of still births.	7	11	9	13	8

	1906	1907	1908	1909	1910
Number of births.	368	469	416	468	584
Number of deaths exclusive of still births.	229	276	250	288	311
Number of deaths of infants under 1 year.	81	45	48	49	52
Percentage of infant to total deaths.	35.4	16.3	19.2	17.0	16.7
Percentage of infant deaths to infant births.	22.0	9.1	11.5	10.5	8.9
Number of still births.	21	11	7	9	9

The number of births in Madison for the period 1901 through 1910 was 3440.

The number of deaths exclusive of still births for that time was 2479.

The number of deaths of infants under one year of age, for the same period, was 490.

19% of the deaths from 1901 through 1910 were infants under one year of age, and 14% of the infants born during that time died. One infant out of every seven born died before it was one year of age.

Chart 3.

Cause of death.	Year.							
	1890	1891	1892	1893	1894	1895	1896	1897
Diphtheria	1		1		1	1		
Influenza	1	1				1		
Dysentery		1						
Whopping cough					1			
Measles								
Scarlet fever	1							
Croup								
Erysipelas								
Septicemia								1
Consumption								
Rheumatism						1		
Meningitis				1		1	1	
Convulsions					1			1
Brain congestion		1				1		
Heart disease								
Bronchitis	1						1	
Pneumonia			4			1	1	3
Diarrheal troubles or digestive diseases.		2				1		3
Peritonitis	2							
Cholera Infantum	1	1	4	1	4			1
Intestinal obstruction								
Premature births				1		2		1
Congenital debility		1				1	1	1
Asphyxia				1				
Malnutrition								1
Marasmus								1
Congenital defects			1					1
Malformation								
Birth accidents								
Spasms								
Nephritis								
Accident	1							
Hemorrage								
Eczema								
Unknown								
Still births			2			1		2
Total	7	7	12	4	7	11	4	16

Chart 4.

Cause of death	Year							
	1898	1899	1900	1901	1902	1903	1904	1905
Diphtheria								
Influenza								
Dysentery	1							1
Whooping cough	1			2	1	3		
Measles		1			1	1		
Scarlet fever			1					
Croup								
Erysipelas	1							
Septicemia					1			
Consumption	1	1						
Rheumatism								
Meningitis		2		1		1	4	
"Convulsions"	2	3	2	1	3		4	4
Brain congestion	2		2					1
Heart disease		2		1	1	1		1
Bronchitis	1	1		1	3	3		1
Pneumonia			2		3	3	2	6
Diarrheal or Digestive troubles	1	1	3	1	6	5	2	3
Peritonitis							1	
Cholera infantum	3	7	5	3	3	1	2	
Intestinal obstruction		1		2			1	1
Premature births	5	5	5	4	4	7	11	12
Congenital debility	4	1	1	1	3	4	2	4
Asphyxia	1			1	1			
Malnutrition				2		2	2	
Marasmus	1	2	1	2				
Comgenital defects		7					3	3
Malformation	1				1	1	1	
Birth accident	2			1				1
Spasms					1		1	
Nephritis				1				
Accident					1			
Hemorrhage							2	
Eczema								1
Unknown		5		1	1		2	
Still births	4		6	7	11	9	13	8
Total	30	34	28	29	47	41	51	47

Chart 5.

Cause of death	Year				
	1906	1907	1908	1909	1910.
Diphtheria					
Influenza					
Dysentery					1
Whooping cough	3				
Measles					
Scarlet fever					
Croup			1		
Erysipelas	1				1
Septicemia					
Consumption				1	
Rheumatism					
Meningitis	4	2	2	2	2
"Convulsions"	3			3	3
Brain congestion					
Heart disease	2	2			
Bronchitis	3	1		2	
Pneumonia	5	4	1	1	2
Diarrheal and digestive troubles	9	5	3	2	4
Peritonitis	1	1			
Cholera infantum	1	1	2	1	3
Intestinal obstruction					
Premature births	10	13	12	14	13
Congenital debility	4	2	5	3	3
Asphyxia			2		
Malnutrition	8	2	4	4	2
Marasmus	1		1		1
Congenital defects	3		4	5	4
Malformation			1	1	2
Birth accident	1		1	1	
Spasms					
Nephritis					
Accident			1		
Hemorrhage			1	2	
Eczema				1	
Unknown	1	1			2
Still births	21	11	7	9	9
Total	81	45	48	49	52

According to the vital statistics, Madison is not a very healthy city for a baby. During the period 1890-1900, 2168 babies were born in Madison, and of that number 160 died before they were one year of age. This means that 1 out of 14 died. But the period from 1900 through 1910 was far worse in its results to infants than the previous one. Of the 3440 babies born during this lator period, 490 died before they reached the age of 1 year, or 1 out of every 7.

It is very probable, in fact almost positive, that these figures do not represent the true state of affairs, as a look at the charts will show. It is hardly possible that the number of births should have decreased from 207 in 1897 to 72 in 1898, or that the number of deaths should have increased from 36 in 1896 to 206 in 1899. A probable solution of these contradictory facts is that births and deaths were not all recorded, or that deaths belonging to one year were registered several years later. It is only since October 1st, 1907, that a good registration law has been in force in Wisconsin, which orders physicians to record births within five days, and which forbids the removal or burial of a ~~baby~~ body without a permit.

The majority of deaths of infants is due to preventable diseases. The preventable diseases include the

contagious diseases - smallpox, diphtheria, measles, scarlet fever etc., which are being successfully combated by science; and diarrheal diseases, pneumonia, bronchitis, cholera infantum, etc., which have not been controlled, to any extent, in America.

In the period 1890-1900, 160 infants died. 11 of these, or 6.8% died of diarrheal and digestive troubles, which include Entero Colitis, Enteritis, Gastritis and other diseases of the stomach. 15 or 9.3 died of pneumonia and bronchitis, 3.1% of meningitis, 16.1% of cholera infantum, 2.5% of diphtheria, 5.6% of "Convulsions," 3.5% died of congestion of the brain, 12.5% were premature births, 6.2% from congenital debility, 5.6% from congenital defects, 3.1% from marasmus, and 9.3% were still births. These deaths comprised 83.6% of the total infant deaths.

During the years 1901 through 1910, 490 infants died under 1 year of age. 8.1% of these died of diarrheal and digestive troubles, 8.3% of pneumonia and bronchitis, 3.6% of meningitis, 3.4% of cholera infantum, none from diphtheria, 4.2% of "Convulsions," 20.4% were premature births, 6.02% from congenital debility, 4.4% from congenital defects, 10.2 % of marasmus, 21.4% were still births.

Several causes, not important during 1890-1900, played a part in the infant mortality from 1900-1910. These were malnutrition, which caused 5.3% of the deaths, and malformation which caused 1.4%. Deaths from unknown causes were 1.6%.

Charts 1 and 2 show for each year from 1890 through 1910, the number of births, deaths exclusive of still births, deaths of infants under 1 year, the percentage of infant deaths to total deaths, the percentage of infant deaths to infant births, and the number of still births. Below charts 1 and 2 is given the total number of births, deaths, infant deaths, the percentage of infant deaths to total deaths, and of infant deaths to births for the periods 1890-1900 and 1901-1910.

Charts 3,4 and 5 give the various causes of infant deaths for each year from 1890 through 1910, and the number of deaths from each cause.

In order to find out whether the infant mortality in Madison is increasing or decreasing, it is necessary to compare the years 1909 and 1910.

In 1909 there were 468 births, 288 deaths exclusive of still births, 9 still births, and 49 deaths of infants under 1 year. The percentage of infant deaths to total deaths was 17%, and that of infant deaths to infant births was 10.5%.

There were, in 1910, 584 births, an increase of 116 over 1909, 311 deaths, an increase of 23 deaths over 1909, 52 deaths of infants under 1 year of age, 3 more than in 1909; the number of still births remained the same - the percentage of infant to total deaths was 16.7, a decrease, and the percentage of infant deaths to infant births was 8.9 - also a decrease. So while the death rate of 1910 shows a slight increase, the birth rate shows a much greater increase over that of 1909.

A comparison with Milwaukee in 1907, 1908, 1909, as to the percentage of infant deaths to births, shows that in spite of its favorable location, in spite of no tenements, no congestion Madison is very little better off than Milwaukee. This would go to prove that infant mortality in Madison is not so much a problem of sanitatiom and general unsanitary conditions, as it is a problem of proper feeding and care of the infant.

In Milwaukee the percentage of infant deaths to births was 13.9% in 1907, 13% in 1908, and 13.9% in 1909. In Madison the percentage of infant deaths to births was 9.1% in 1907, 11.5% in 1908, and 10.5% in 1909.

May, June, July, November and December were most favorable months for infants in Madison during 1910. From January to May, the time was not as good, but

August is the worst month of all. From January to May 14 infants died, in May 4, in June 3, in July 1, in August 14, in September 5, in October 5, in November none and in December 2. 1 death in August was from accident, 5 from diarrheal and digestive troubles, 3 from congenital defects, 2 from premature births and 3 were still births.

According to the death records there were no infant deaths in 1st ward in 1910, in 2nd ward there were 4, in 3rd ward there were 2, in 4th ward 4, in 5th ward 6, in 6th ward 9, in 7th ward 2, in 8th ward 7, in 9th ward 12, in 10th ward 1. So the healthiest wards for babies are the 1st, 3rd, 7th and 10th, while the unhealthiest wards, in the order of their arrangement, are the 9th, 6th, 8th, 5th and 4th. The 9th ward had the most infant deaths in 1910, 25% of the infant deaths were recorded from that ward.

In a city like Madison, which is noted for its location, scenery, its university, etc., there seems every reason that the infant mortality should be conspicuous also for its low percentage. As matters stand at the present time, Madison has much to do to study the causes of her infant mortality and effect ways and means to check it. These ways and means will be discussed in chapter III.

CHAPTER III.

Methods of Preventing Infant Mortality.

The National Conservation commission has estimated that the average value of every infant at birth is $90. Considering that it takes a human infant about twenty years to become profitable on a commercial basis, by the time it has reached that age, it represents an investment of about $4000.

On the average, about 3,100.000 babies are born in America every year, so that they represent $279,000,000 to start with. In twenty years if there were no losses from death, they would represent a value of 12 billion, 400 million dollars. When the full force of this new valuation of infant life becomes apparent, great impetus will be given to the fight against infant mortality.

Dr. Cressy L. Wilbur, Chief Statistician Bureau of The Census, Washington, says that accurate vital statistics are absolutely necessary for the conduct of any intelligent campaign against the preventable causes of death. The accurate statement of infantile mortality requires the complete and satisfactory registration of both births and deaths. Only 55.3% of the population of the United States has even fairly accurate registration for deaths, and the registration of births is much worse. The remedy for this is the enactment of adequate laws for the complete registration of births and deaths in all states, that do not, at present, possess them; and the

thorough enforcement of the present laws and of the new laws when enacted.(1)

In regard to the registration of births and deaths the American Association for the Study and Prevention of Infant Mortality at its first annual meeting approved of the model law for the registration of births and deaths, as recommended by the American Medical Association, the American Public Health Association, and the United States Bureau of the Census.(2)

Early notification of births is absolutely essential for the prevention of disease; the full measure of protection to infant life cannot be extended unless all births are promptly registered.(3)

Reasons demanding the registration of births and deaths are: (1) Knowledge of the movement of population; (2) protection of the lives and health of the people; (3) protection of the rights of the individual and of the community.(4)

Since October 1st, 1907, Wisconsin has had a good law for the prompt registration of births and deaths. No

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(1) Report of the American Association for the Study and Prevention of Infant Mortality, 1910, p.94.
(2) Ibid: p.106.
(3) Monthly Health Bulletin of New York, Oct.1910,p.269.
(4) Report on the Legal Importance of Registration of Births and Deaths, p. 7.

body can be removed or buried until notification is made of the death and a burial permit received; and every physician and midwife must record births within five days.

An unusual proportion of deaths are due to digestive disturbances. This shows the influence of diet on infant mortality, as digestive diseases depend, almost always, on faults in feeding.(1) *

Maternal nursing is of fundamental importance in preserving the life of the infant. It is understood that a great number of bottle fed infants die of malnutrition anddiarrheal diseases, but it is not generally known that nearly all the infantile diseases take place because these infants lack the stamina and recuperative power possessed in much greater degree by breast fed babies.(2) The breast fed infant carefully looked after, has far better chance than the bottle fed baby more carefully tended.(3) Ten bottle fed babies die to one breast fed baby.(4) *

There is but one truly proper feeding, suitable breast milk given in a suitable manner. Undoubtedly a

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(1) American Academy of Medicine Conference, 1909, p.44.
(2) American Association for the Study and Prevention of Infant Mortality, 1910, pp.251-54.
(3) Indiana Health Report, 1905, pp.131-138.
(4) Health Bulletin of Kansas, June 1910,p.15.
* Resume from Chapter I.

great many deaths could be prevented by a greater persistence on the part of the mother in nursing.(1) The high mortality of gastro intestinal disease prevails especially in bottle fed infants; and the influence of excessively hot weather is seen almost entirely in these babies.(2) There is something to be considered in the composition of milk besides proteid, fat, carbohydrate and water. The additional factors include the passage, through the normal milk to the child of substances which carry on bodily functions, including that of protection against infection. It has been proven by Ehrlich and Brieger from experiments on mice, that milk is capable of conveying antitoxic substances after these have been injected into the mother. It has also been found that the bactericidal power of the serum of the blood in breast fed children was far greater than in those artificially fed.(3) Human breast milk is not strictly sterile, though it usually contains only organisms of low virulence, as staphylococcus albus. Cow's milk is not only not sterile when it leaves the animal, containing often streptococci and tubercle baccilli, but is given many opportunities for further contamination before it reaches

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(1) American Academy of Medicine Conference,1909,p.45.
(2) American Academy of Medicine Conference,1909,p.47.
(3) American Academy of Medicine Conference, pp.67-68.

the infant.(1) Provided the mother's breasts are not diseased, human milk is a safe food relatively as far as bacterial content is concerned, while the use of cow's milk gives more or less time for the multiplication of bacteria before it is consumed.(2)

Of the various ways of feeding then direct maternal nursing gives the protection to the infant, and it follows that everything should be done to stop artificial feeding and so greatly reduce infant mortality.(3) Artificial feeding is on the increase. Young women should be educated in the care of infants so that they will understand how important breast feeding is.(4) Although many realize that the breast fed baby is comparatively immune to death, the fact remains that many thousands of infants are unable to obtain maternal nourishment. Two main reasons for this maternal impotency are: physical disability due to improper nourishment and disease, and industrial employment, due principally to abject poverty. Added knowledge and intelligence must be created before the problem of infant mortality can be satisfactorily solved.(5)

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(1) American Academy of Medicine Conference, pp.68-70.
(2) American Academy of Medicine Conference,1909, p.70.
(3) American Academy of Medicine Conference,1909, p.73.
(4) American Assoc. for Study, etc. of Infant Mortality, 1910, p. 254.
(5) The Survey, Volume 22, p. 624.

The diet is a factor in the production of death first through its composition. Faulty cows' milk mixtures have too much to do with it. The pernicious custom is wide spread of giving every infant a formula of a certain strength because it has reached a certain age. Too little study is given to the different ingredients of the milk mixture. More infants are over fed than under fed, and this produces digestive disturbances which are often fatal.(1) *

The numerous proprietary foods on the market, altho they have saved life, are one of the most fertile sources of infant mortality. Not only is the composition of most of them faulty, but they are advised and given on the faulty principle of one food to suit many infants.(2) *

Pure milk is a great factor in the work of saving babies. For the baby the problem of obtaining clean, wholesome milk is much more important than the water problem. Boiling and filtering water makes it fit to drink, but this is not the case with milk. Bacteria may be destroyed, but their products remain. Sterilization, or even pasteurization of ordinary milk for babies cannot solve the problem. Commercial pasteurization is not safe because it permits dirty milk to be treated so that it

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(1) American Academy of Medicine Conference, 1909, p.47.
(2) American Academy of Medicine Conference, 1909, p.48.
* Resume from Chapter I.

will not sour readily. Therefore, clean, pure cow's milk must be produced, free from injurious substances and pathogenic germs, and kept in such condition all the way from cow to consumer.(1)

No single agency is as important in the campaign against infant mortality as the infants' milk depot. It is not merely a depot from which milk is distributed, but it is an educational centre, a district branch for dispensation of relief, and is a coordinating unit between nurses, physicians, dispensaries and clinics.(2)

It should be located where it can be easily reached by the mothers' patronizing it. The equipment may be simple or elaborate. The nurse should be thoroughly competent as to feeding and care of infants, intelligent and capable. Doctors should have weekly classes for the mothers and teach infant hygiene and feeding. The nurse should go to the houses and see that the mothers are carrying out instructions.(3)

No child should receive milk until it is proven that the mother herself is not able to supply the milk. The milk stations are not to take care of sick children but to keep children well. It would make better mothers of

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(1) Report of Babies Dispensary and Hospital of Cleveland, 1910, p. 17.
(2) American Assoc. for Study, etc., of Infant Mortality, 1910, p. 75.
(3) Ibid: pp.76-85.

them, if fifty women would come once a week to hear about housing conditions, dietetics, and economics. Such education in many districts has lessened the amount of infant mortality.(1)

With this idea in mind, the New York Milk Committee in June 1908, opened seven milk depots in New York City. Here certified milk was sold, obtained from the Tully Farms herd, one of the best dairy herds in America. Each depot was in charge of a group of volunteer physicians, under a service physician elected by them. They examined the babies at weekly classes, weighed them, prescribed their exact feeding, and educated the mothers by talks on infant feeding and hygiene, patterned after the consultations des nonrrissons of France. Trained nurses, employed by the committee, supervised the distribution of milk, assisted the doctors at the classes, and visited the homes to see that the mothers actually did what they were told. Every morning the exact amount of milk needed properly prepared and refrigerated was brought to each station. The saving of lives among the infants fed at the depots was 50%.(2) What is true of New York City can be true for the entire country. To face the problem, clean milk must be provided, and where money is not

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(1) American Assoc. for Study, etc., of Infant Mortality, p. 86.

(2) Survey, Volume 22, pp. 626-627.

available for certified milk, the milk must be pasteurised. Instruction of the mothers is imperative in this work, and there must be co-operation of relief societies with milk dealers, doctors and health authorities. Not until these things are done is a solution of the problem possible.(1)

G. W. Goler found by careful work in regard to infant mortality in Rochester, New York, that the infantile death rate bore a close relation to the average number of bacteria per cubic centimeter found in the municipal milk supply. This shows clearly the importance of the bacteriological study of milk, and the need of precautions to minimise the effects of any pathogenic bacteria it may contain.(2) *

Clean milk, therefore, is one of the requirements for the prevention of infant mortality due to diet, and much has been gained by efforts in this direction. The public are slowly but surely awakening to the benefits which result from having milk as nearly germ proof as possible. In Rochester, the mortality of infants has been reduced 65% since the introduction of the carefully guarded city milk supply. In France the average infantile mortality in ten years was reduced from 167 per

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(1) Survey, Volume 22, pp. 627-631.
(2) American Academy of Medicine Conference,1909,p.68-70.
* Resume from Chapter I.

thousand to 137 per thousand, mainly through the more careful supervision of the milk supply.

In August, 1908, in Chicago, 719 babies under 2 years of age died from diarrhoeal diseases alone. July and September were almost as bad. Other hundreds of babies managed to live with constitutions ruined. Later they will be found among the backward children, then among the delinquents, and finally, will be books of charity organizations.(1) An Infants Welfare Committee was organized in 1908 for the purpose of reducing infant morbidity and mortality. To do this they co-operated with the medical profession, and have tried to educate the community until it organizes to meet the needs. Summer does not necessarily mean diarrhea. July and August are not natural enemies to the baby. Their action on the child is not direct but indirect, through dust, smoke, flies, deteriorated milk and other food. These conditions are entirely subject to correction and control.(2) The campaign carried on in Chicago during the summer of 1909 was very successful. The central point of the campaign was the baby register in the United Charities office, with Dr. Caroline Hedger as director.

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(1) Survey, Volume 22, p. 685.
(2) Survey, Volume 22, p. 687.

Here was gathered the record of all babies born during the summer and for some months back; these babies numbered 35,000. A corps of Health Department nurses covered the high death wards. Literature for summer care of babies, in nine different languages, was distributed. In homes where babies were ill, there were 5000 such, especial care was taken to do the effective things for the baby. Through the Elizabeth McCormick Memorial Fund, the United Charities of Chicago was able to place fresh air stations, 10 tents, in the midst of the thickest baby death districts. Here 2000 of the sickest babies were cared for.

In the wards where the campaign was centered, the congested wards, the death rate over the previous August had declined 6%. In the well-to-do wards, where no work was done, it had increased 44% per the same period.(1)

France has lowered its infant death rate from 238 per thousand births in 1898 to 158 in 1901-05.(2) This decrease has been brought about by the formation of "Consultations" in connection with the maternity hospitals, where the mother is required to bring the baby once a week or fortnight. There it is weighed, loss or gain

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(1) American Assoc. for Study, etc., Infant Mortality, pp. 70-71.
(2) Nineteenth Century, January, 1909, p. 61.

noted, and directions given the mother as to the care of the baby. As many of the babies had to be fed artificially, good sterilised milk was provided. Not a single baby has died at the first "Consultations," since they were established in 1892 by Professor Budin, late Director of l'Hopital de la Charite.(1) These extraordinary results, obtained in France, are due without doubt to the combination of medical supervision of the healthy babies, the increased breast feeding, and the supply of reliable milk.(2) "Consultations" for babies could be started in connection with the large hospitals in the large cities at a very small cost. Professor Budin states that only three things are necessary for a "consultation"- a room, a baby balance, and the devotion of a doctor. It would not be necessary for the hsopitals to supply milk; it would be possible to have shops known to the hospitals, where safe fresh milk could be obtained, and the mothers could be instructed in the care and sterilizing of the milk.(3)

The large number of deaths due to so called "inavoidable" causes - premature birth, congenital debility, are really due to weaknesses of the parents, alcoholism,

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(1) Nineteenth Century, January, 1909, pp.54-58.
(2) Nineteenth Century, January, 1909, p. 63.
(3) Nineteenth Century, January, 1909, p. 63.

social diseases, and very often in the case of premature births, to crime. The number of babies whose death is due to premature birth, is increasing every day. It is well known that there are doctors who make a practice of aiding, and furnishing the means by which a woman, who surely is unworthy the name of woman, can get rid of an unwelcome offspring. It is easier to stop these so called doctors from doing these outrageous things, than it is to stop the women. The doctors should be severely punished by law, but it is very seldom that a doctor of this kind is caught. Shame and fear of death seem to have no terror for these women. The only remedy for this outrage is to carefully educate the next generation; as it seems not possible to reform the women who are taking measures to kill the offspring,before it is born.

The future of the body of the baby is determined before birth. Its body, blood and nerves are mostly the results of inheritance. The future of the infant depends on the functional and organic constitution of its father and mother. Their health furnishes healthy infants; their debility or contamination, a feeble or contaminated offspring. The diseases and faculties of the parents will be reproduced actually or petentially in the offspring, although not always in the same form.(1)

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(1) Amer. Assoc. Study,etc. Infant Mort.1910,pp.43-44.

The nutrition and mode of life of the mother during pregnancy have large influence on the child before birth, By regulating the diet of a pregnant woman it is possible to influence the size, weight and bony development of the unborn child.(1) Adverse conditions before birth are more or less responsible for deaths due to defective nutrition, as atrophy, debility, marasmus and inanition. Fortunately there are signs that the importance of the influence of intra-uterine conditions on the future development of the child are being increasingly recognized. For the prevention of infant mortality from adverse intra-uterine conditions, we must look to agencies which will regulate the life of the mother during pregnancy, so as to secure to her such conditions as rest, good food, freedom from anxiety, abstinence from alcohol and other injurious drugs, and maintenance of a high standard of personal hygiene.(2) The women of the nation must be healthy, else the young will be feeble and sickly. The vast majority of the confined women in the large cities have no time to recover. Only a few days are allowed for recovery, instead of two months, at the least, which is the shortest period in which the organs can become normal.(3) These

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(1) Infant Milk Depots-Cleary,pp.17-18.
(2) Infant Milk Depots-Cleary,pp.23-24.
(3) American Association for Study, etc., Infant Mortality, 1910, pp. 43-50.

conditions have brought about a dangerously high death rate for infants, and a decreasing birth rate.(1)

We must know what kind of work women do and under what conditions it is done. There must be a careful laboratory study of women to know what effect different kinds of work have on reproductive processes. Relationship must be found between occupations and sterility and inability to nurse children. Cities with like occupations must be compared. The best plan is to keep every woman at home, who has a child less than three years of age. Pension the widows if necessary, but keep them at home and see that they do right by their children.(2)

Of the recorded deaths due to acute natal causes one-half might be avoided or amended by proper care of expectant mothers during the last twelve weeks of pregnancy. Of the recorded post-mortality under the age of one year, about one-third is due to acute natal causes.(3)

The enormous death rate among infants during the first three months is due almost entirely to congenital debility, malformation, atrophy, and other results of immorality, unwholesome social conditions, and physical degeneration.(4) Social diseases play a large part in

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(1) American Academy of Medicine Conference, 1909, p.40.
(2) " " " " " " p.40-41.
(3) Amer. Assoc. for Study, etc., Inf. Mort. 1910, p.151.
(4) Survey, Volume 22, p.623.

infant mortality, although the deaths due to them are listed under many different heads. Syphilis is one of the principal causes of premature births. Fifty per cent of infected women are rendered sterile, while a larger proportion are sterile after the birth of the first child. Gonorrheea is responsible for practically all the blindness which babies incur at birth. Syphilis either kills the offspring outright, or so vitiates the processes of nutrition, that infants come into the world with the mark of death upon them. If they do survive, they carry through life the evidences of degeneracy and decay. The public must become enlightened, and co-operative social forces set to work.(1) * Utah has just passed a law, making venereal diseases notifiable. Physicians are required to report all cases, but without the name of the sufferer. Local Boards of Health are authorised to take measures to protect the public health against these dangers. It is the first state to make social diseases notifiable and to empower Health Boards to take steps for prevention. Credit for this law is given to the women of Utah, who have the right of equal suffrage.(2)

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(1) Monthly Health Bulletin of New York, March, 1910.
(2) Woman's Journal, May 13, 1911.
* Resume from Chapter I.

In every state in the Union, there should be legislation for the prevention of improper marriages, for the control of the "black plague", for the prevention of the propogation of the defective classes, and for the suppression of the free traffic in liquor, which has so much to do with heredity. This would prevent the greater part of the socalled non-preventable mortality, would be productive of better health in older children, and would increase vital resistance; all tending to a more moral and hardy race. Although these methods would decrease the birth rate, a serious problem would be solved- the care of the defective class, which is a prominent factor in producing infant mortality.(1) When the full duty of the municipality is performed many causes classed non-preventable will be classed as preventable.

In the reduction of infant mortality many diverse factors are concerned - proper housing, sanitation, lessened evils of congested living quarters, pure water and milk supply, pure food and hygienic personal habits. This can be obtained only by means of wide-spread education of the masses. Other necessary measures are rigid dairy inspection, a determined crusade against flies, elimination of filth, removal of unsanitary areas,

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(1) American Association for Study, etc., Infant Mortality, 1910, pp. 153-154.

the erection of sanitary dwellings, local control of midwives.(1)

The most important means of reducing infant mortality is by education in the public schools, beginning with the lowest grades. Nature study in the schools offers chance for instruction in sex through observation of animals that reproduce rapidly, plant raising and breeding, and lessons in heredity. In addition to nature study in the lower grades, there should be lessons in botany and biology in the upper grades, and in civics at adolescent period to awaken the dormant social conscience of the child. Work in biology should be compulsory for all students in the first year of High School, if not given in the seventh and eighth grades.(2) The course in physiology and hygiene comes best in the first year of the High School.

If we educate the school girls, who are the potential mothers, in biology, physiology, home making, humanics, care of the child, social problems and heredity, if we educate the public by means of the news-

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(1) American Academy of Medicine Conference,1909,p.229.
(2) American Association for Study etc., Infant Mortality, 1910, pp.224-96.

papers, if we educate the mothers, and make stringent laws for the prevention and elimination of social evils, we shall have gone a long way towards solving the problem, and it is possible that in the next generation we will have no problem of Infant Mortality.

Dated: June seventh, 1911

Approved: Abby L. Marlatt

Professor of Home Economics

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